



***PRELIMINARY***



## **BWX 8415 Basestation Installation and Commissioning Guide**

October 30, 2009

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# PRELIMINARY

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The following information is for FCC compliance of Class B devices: The equipment described in this manual generates and may radiate radio-frequency energy. If it is not installed in accordance with Cisco's installation instructions, it may cause interference with radio and television reception. This equipment has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in part 15 of the FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

Modifying the equipment without Cisco's written authorization may result in the equipment no longer complying with FCC requirements for Class A or Class B digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

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## About This Document

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### Purpose

This document provides a Cisco-qualified BWX Mobile WiMAX™ Installation & Commissioning Technician or Field Engineer with instructions to properly install a BWX 8415 Basestation (BS). The scope includes the Radio Unit (RU), Antenna Unit (AU), power and grounding, the backhaul network, the Access Services Network-Gateway (ASN-GW) & Broadband Wireless Gateway (BWG), and all cabling. It also includes acceptance testing procedures.



**Warning**

---

**For safety and compliance reasons, the installation and configuration described in this document should be attempted only by persons who have completed appropriate training and achieved proper technical certifications regarding the use and support of the applicable products. Incorrect installation, configuration and/or service may lead to damage to the product(s) and/or risk of personal injury, and may void your product warranty and/or entitlement to support services. You, the customer, are responsible for obtaining and maintaining any required regulatory licenses, following appropriate safety procedures, and providing adequately trained staff to perform any installation, configuration and service of the products described herein.**

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### Revision History

Date	Revision/Version	Contributors	Editor	Comments
10.30.09	-/01	PLM, Engineering	J. Carrasco	Release 10.0

### Terms

The information in this document pertains to the BWX Mobile WiMAX system. In this document and all customer documents as of this release, when referring to the BWX Mobile WiMAX Basestation, the term “BS” is used.

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# CHAPTER 1

## Safety

---



### Caution

This document provides a Cisco-qualified BWX Mobile WiMAX Installation & Commissioning Technician or Field Engineer with instructions to properly install a BWX 8415 Basestation (BS). Installations performed by non-Cisco-qualified specialists will void warranties and could damage equipment and/or cause bodily injury.

---

To optimize safety and expedite installation and service, read this document thoroughly. Follow all warnings, cautions, and instructions marked on the equipment and included in this document. To aid in the prevention of injury and damage to property, cautionary symbols have been placed in this document to alert the reader to known potentially hazardous situations, or hazards to equipment or procedures. The symbols are placed before the information to which they apply. However, any situation that involves heavy equipment and electricity can become hazardous, and caution and safety should be practiced at all times when installing, servicing, or operating the equipment.

## Warnings

Translated versions of all safety warnings are available in the safety warning document that shipped with your BS or on Cisco.com. To browse to the document on Cisco.com, refer to Appendix G, “[Translated Safety Warnings](#)” for instructions.



### Warning

#### IMPORTANT SAFETY INSTRUCTIONS

---

**This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.**  
Statement 1071

#### SAVE THESE INSTRUCTIONS

---



### Caution

This is the symbol for “Caution - risk of equipment damage or risk of bodily injury.”

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**Warning**

This is the symbol for Electro-magnetic Compatibility (EMC) and Telecom non-safety related warnings.



**Warning**

This equipment must be externally grounded using the supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 366



**Warning**

Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001



**Warning**

Read the installation instructions before connecting the system to the power source. Statement 1004



**Warning**

Class 1 Laser product. Statement 1008



**Warning**

Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040



**Caution**

- Refer installation and service to qualified service personnel only. No user serviceable parts inside.
- Installation must be done in accordance with the instructions contained in this manual.
- Read these instructions before installing.
- Save these instructions.



**Warning**

- In the United states, installation must be in accordance with the National Electric Code (N.E.C.), NFPA 70 article 810.
- In Canada, installation must be in accordance with the Canadian Electrical Code (C.E.C.), CSA C22.2, No.1. Section 54.
- Do not mount antennas on utility poles, electric service mast, or other structures carrying electric light or power wires. The unit and associated wiring must maintain clearance of at least 2 feet (.61 M) from power or light wires of less than 250V, or at least 10 feet (3.048 M) from power wires of more than 250V, per N.E.C., Article 810, C.E.C. Section 54.
- Accidental contact with high voltage wires may result in death. Watch for overhead electric power lines when erecting the unit.
- Install in accordance with all national, regional, or local electrical and building codes.

Cisco expressly requires that when using Cisco electronic equipment always follow the basic safety precautions to reduce the risk of electrical shock, fire, and injury to people or property.

1. Follow all warnings and instructions that come with the equipment.
2. Do not disassemble the Radio Unit (RU) equipment. Removing the RU's covers exposes dangerous voltages or other risks and also voids the warranty. Incorrect reassembly can cause equipment damage or electrical shock. Only an authorized repair technician should service this product.

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The BS is a Radio Frequency transmitter. It is required to comply with FCC and local country RF exposure requirements for transmitting devices. A minimum separation distance of 2 meter or more must be maintained between the antenna and all persons during device operations to ensure compliance with the FCC's and the local country's rules for Radio Frequency Exposure. If this minimum distance cannot be maintained, exposure to RF levels that exceed the FCC's and the local country's limits may result.



## Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules and local country rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## Information to User

The BS has been authorized as a radio frequency transmitter under the appropriate rules of the Federal Communications Commission. Any changes or modifications not expressly approved by Cisco could void the user's authority to operate the equipment.

## Safety Information

Follow the guidelines in this section to ensure proper operation and safe use of the access point.

### Safety Precautions for the BWX 8415 Basestation



**In order to comply with radio frequency (RF) exposure limits, the antennas for this product should be positioned no less than 6.56 ft. (2 m) from your body or nearby persons.** Statement 339



**Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001



**Class 1 laser product.** Statement 1008



**A readily accessible two-poled disconnect device must be incorporated in the fixed wiring.** Statement 1022

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**Caution**

Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030


**Warning**

**Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards.** Statement 1033


**Warning**

**When installing or replacing the unit, the ground connection must always be made first and disconnected last.** Statement 1046


**Warning**

**Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, because they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada: Canadian Electrical Code, Section 54).** Statement 1052


**Warning**

**Installation of the equipment must comply with local and national electrical codes.** Statement 1074

1. The BS must be installed in accordance with NEC/CEC Articles 800/810/830.
2. At a minimum, all DC power leads and bonding/grounding straps shall be 6 AWG or 8 AWG copper conductors.
3. Power cables in excess of 140 feet in length must have protective devices installed that are UL listed to UL 492, UL497A or UL497B, UL497C, and UL1449.
4. The BS must be connected to a power supply/rectifier that is IEC 60950-1 certified (UL listed to UL60950-1 in North America) having a SELV output.
5. All power and ground conductors must be mechanically supported to avoid strain of the wires and connection points.
6. There must not be a switch or disconnect device installed in the ground cabling.
7. A UL listed disconnect device, such as a circuit breaker, must be installed between the power supply and BS chassis connections. The BWX 8415 BS requires a 60V, 15A, 1 sec. max break time circuit breaker.
8. Power-interconnect wires between the power supply/rectifier and the BS unit must have heat shrink tubing applied over the barrel of the terminal lugs after crimping the wire. A picture is provided in the "Installation" section of this manual.
9. External power source / supply considerations for the - 40.5V DC to - 58.0V DC BS chassis:
  - a. An external method of disconnecting each of the DC power Load/Return lines to the BS chassis is required (i.e. - fuse + disconnect device). The BWX 8415 BS requires a 15A circuit breaker.
  - b. The external power supply shall be at least 1000 Watt rating, with a maximum current > 20 amps.

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- c. The external DC power source, if current limited, shall have the limit set-point configured higher than the BS Chassis breaker rating. (i.e. - If the power source is current limited to 10 amps and the BS circuit breaker is a 15 amp breaker, it will never trip because the power supply is limiting the current to 10 amps.)
- d. The external supply "Return" and the BS chassis shall be connected to a common Earth ground. The BS Chassis has an external ground lug provided. The "+" terminal on the external power supply is considered "Return or RTN" on a -48V system.
- e. Do not remove protective earth connection before disconnecting the BS from the DC power supply.

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## CHAPTER 2

# Regulatory Information and Declarations of Conformity

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## Regulatory Information

### Regulatory Requirements

Cisco BWX 8415 Basestations (BS) meet the following regulatory requirements:

- 2.3GHz:  
(2300-2400MHz)      FCC Part 2, Part 15-B, Part 27  
ETSI EN 302 326-2 V1.2.2, EN 301 489-4 V1.4.1, EN 503 85  
RSS 195 (6.3, 6.4)  
EN60950-1 & -2  
UL 60950-1 & -2  
CE Mark
- 2.5& 2.6GHz:  
(2483.5-2690 MHz)      FCC Part 2, Part 15-B, Part 25, Part 27  
ETSI EN 302 326-2 V1.2.2, EN 301 489-4 V1.4.1, EN 503 85  
RSS 193 (6.5)  
EN60950-1 & -2  
UL 60950-1 & -2  
CE Mark
- 3.4& 3.5GHz:  
(3400-3525 MHz)  
(3475-3600 MHz)      ETSI EN 302 326-2 V1.2.2, EN 301 489-4 V1.4.1, EN 503 85  
RSS 192 (5.5, 5.6)  
EN60950-1 & -2  
UL 60950-1 & -2  
CE Mark

### Regulatory Label

This is an **example** of the regulatory label affixed to each BS unit. It provides identification information and appropriate regulatory approvals for that unit.



**Note**

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The professional installer may want to inspect the labels before installation, as thereafter his view of them may be obstructed.

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Need Example of Regulatory Label for BWX 8415

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## Declarations of Conformity

This section provides declarations of conformity for the BWX 8415 Basestation (BS).

This appendix contains the following sections:

- [Federal Communication Commission \(FCC\) Certification](#)
- [Declaration of Conformity for RF Exposure](#)
- [Declaration of Conformity with Regard to the 1999/5/EC \(R&TTE Directive\)](#)
- [Declaration of Conformity Statements](#)

## Federal Communication Commission (FCC) Certification

### Model:

WX-BS8415-23-R1  
 WX-BS8415-25-R1  
 WX-BS8415-34-R1  
 WX-BS8415-35-R1

### FCC Certification number:

WX-BS8415-23-R1:	Need FCC Certification number
WX-BS8415-25-R1:	Need FCC Certification number

### Manufacturer:

Cisco Systems, Inc.  
 170 West Tasman Drive  
 San Jose, CA 95134-1706  
 USA

This device complies with Part 15 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits of a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and radiates radio frequency energy, and if not installed and used in accordance with the

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instructions, may cause harmful interference. However, there is no guarantee that interference will not occur. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician.



**Warning**

---

**The Part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using Cisco-supplied antennas. Any changes or modification to the product not expressly approved by Cisco could void the user's authority to operate this device.**

---



**Warning**

---

**To meet regulatory restrictions, the BS must be professionally installed.**

---

## **Declaration of Conformity for RF Exposure**

This Cisco product is designed to comply with the following national and international standards on Human Exposure to Radio Frequencies:

- US 47 Code of Federal Regulations Part 2 Subpart J
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers / IEEE C 95.1 (99)
- International Commission on Non Ionizing Radiation Protection (ICNIRP) 98
- Ministry of Health (Canada) Safety Code 6. Limits on Human Exposure to Radio Frequency Fields in the range from 3kHz to 300 GHz
- Australia Radiation Protection Standard
- To ensure compliance with various national and international Electromagnetic Field (EM F) standards, the system should only be operated with Cisco approved antennas and accessories.

For systems defined as Fixed Systems or systems that require professional installation for the antennas or the antennas are roof mounted.



**Note**

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The minimum separation distance allowed is 2 meters. In these cases the distance is generally greater than 1 meter, please verify actual MPE distance with project compliance engineer

---

For systems requiring On-Site evaluation See – statements for On-site evaluation

- US  
This system has been evaluated for RF exposure for humans in reference to ANSI C 95.1 (American National Standards Institute) limits. The evaluation was based on evaluation per ANI C 95.1 and FCC OET Bulletin 65C rev 01.01.

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The minimum separation distance from the antenna to general bystander is 6.56 ft. (2 meters) to maintain compliance.

- Canada

This system has been evaluated for RF exposure for humans in reference to ANSI C 95.1 (American National Standards Institute) limits. The evaluation was based on evaluation per RSS-102 Rev 2.

The minimum separation distance from the antenna to general bystander is 2 meters (6.56 ft.) to maintain compliance.

- EU

This system has been evaluated for RF exposure for humans in reference to the ICNIRP (International Commission on Non-Ionizing Radiation Protection) limits. The evaluation was based on the EN 50385 Product Standard to Demonstrate Compliance of Radio Base stations and Fixed Terminals for Wireless Telecommunications Systems with basic restrictions or reference levels related to human exposure to radio frequency electromagnetic fields from 300 MHz to 40 GHz.

The minimum separation distance from the antenna to general bystander is 2 meters (6.563 ft.).

Generic Statements – for other countries

- ANSI C 95.1 (99)

This system has been evaluated for RF exposure for humans in reference to the ANSI (American National Standards Institute) limits as referenced RF in C 95.1 (99).

The minimum separation distance from the antenna to the user is 6.56 ft. (2 meters).

- ICNIRP Limits

This system has been evaluated for RF exposure for humans in reference to the ICNIRP (International Commission on Non-Ionizing Radiation Protection) limits.

The minimum separation distance from the antenna to the user is 2 meters (6.56 ft.).

**PRELIMINARY****Declaration of Conformity with Regard to the 1999/5/EC (R&TTE Directive)**

This declaration is only valid for configurations (combinations of software, firmware, and hardware) provided and supported by Cisco Systems. The use of software or firmware not provided and supported by Cisco Systems may result in the equipment no longer being compliant with the regulatory requirements.

Česky [Czech]:	Toto zařízení je v souladu se základními požadavky a ostatními odpovídajícími ustanoveními Směrnice 1999/5/EC.
Dansk [Danish]:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Direktiv 1999/5/EF.
Deutsch [German]:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprechenden Vorgaben der Richtlinie 1999/5/EU.
Eesti [Estonian]:	See seade vastab direktiivi 1999/5/EÜ olulistele nõuetele ja teistele asjakohastele sätetele.
English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]:	Este equipo cumple con los requisitos esenciales así como con otras disposiciones de la Directiva 1999/5/CE.
Ελληνική [Greek]:	Αυτός ο εξοπλισμός είναι σε συμμόρφωση με τις ουσιαστικές απαιτήσεις και άλλες σχετικές διατάξεις της Οδηγίας 1999/5/EC.
Français [French]:	Cet appareil est conforme aux exigences essentielles et aux autres dispositions pertinentes de la Directive 1999/5/EC.
Íslenska [Icelandic]:	Þetta tæki er samkvæmt grunnkröfum og öðrum viðeigandi ákvæðum Tilskipunar 1999/5/EC.
Italiano [Italian]:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/CE.
Latviski [Latvian]:	Šī iekārta atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]:	Šis įrenginys tenkina 1999/5/EB Direktyvos esminius reikalavimus ir kitas šios direktyvos nuostatas.

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Nederlands [Dutch]:	Dit apparaat voldoet aan de essentiële eisen en andere van toepassing zijnde bepalingen van de Richtlijn 1999/5/EC.
Malti [Maltese]:	Dan l-apparat huwa konformi mal-htigiet essenzjali u l-provedimenti l-oħra rilevanti tad-Direttiva 1999/5/EC.
Magyar [Hungarian]:	Ez a készülék teljesíti az alapvető követelményeket és más 1999/5/EK irányelvben meghatározott vonatkozó rendelkezéseket.
Norsk [Norwegian]:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-direktiv 1999/5/EF.
Polski [Polish]:	Urządzenie jest zgodne z ogólnymi wymaganiami oraz szczególnymi warunkami określonymi Dyrektywą UE: 1999/5/EC.
Português [Portuguese]:	Este equipamento está em conformidade com os requisitos essenciais e outras provisões relevantes da Directiva 1999/5/EC.
Slovensko [Slovenian]:	Ta naprava je skladna z bistvenimi zahtevami in ostalimi relevantnimi pogoji Direktive 1999/5/EC.
Slovensky [Slovak]:	Toto zariadenie je v zhode so základnými požiadavkami a inými príslušnými nariadeniami direktív: 1999/5/EC.
Suomi [Finnish]:	Tämä laite täyttää direktiivin 1999/5/EY olennaiset vaatimukset ja on siinä asetettujen muiden laitetta koskevien määräysten mukainen.
Svenska [Swedish]:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

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For 2.3 GHz, the following standards were applied:

- Radio: EN 302 326-2 V1.2.2
- EMC: EN 301 489-4 V1.4.1
- Safety: EN 60950-1, EN 60950-2

For 2.5-2.6 GHz, the following standards were applied:

- Radio: EN 302 326-2 V1.2.2
- EMC: EN 301 489-4 V1.4.1
- Safety: EN 60950-1, EN 60950-2

For 3.4-3.5 GHz, the following standards were applied:

- Radio: EN 302 326-2 V1.2.2,
- EMC: EN 301 489-4 V1.4.1
- Safety: EN 60950-1, EN 60950-2

**Note**

This equipment is intended to be used in all EU and EFTA countries. Outdoor use may be restricted to certain frequencies and/or may require a license for operation. For more details, contact Cisco Corporate Compliance.

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The following CE mark is affixed to the basestation, user's manual, and packaging:



### **Declaration of Conformity Statements**

All the Declaration of Conformity statements related to this product can be found at the following URL:

<http://www.ciscofax.com>





**PRELIMINARY**

## CHAPTER **3**

# Overview

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## 3.1 Scope of this Guide

This document was created specifically for the BWX 8415 Basestation (BS), which allows service providers to service users with Mobile WiMAX technology.

WiMAX is a standards-based, Orthogonal Frequency Division Multiplexing Access (OFDMA) technology. The procedures in this document are non-frequency specific. This guide serves as the instructions for all BWX 8415 BS installations.

## 3.2 How to Use This Guide

Properly installing and commissioning a BS into commercial operation begins with planning. Cisco advises skills-certified Installation & Commissioning Technicians to review this entire document and its referenced material at the beginning of a successful deployment.

Cisco is serious about ensuring your success. In fact, Cisco does not warranty its hardware if the BS has not been deployed by a Cisco skills-certified Installation & Commissioning Technician. To install and commission a BS, you will need a standard toolkit, as well as Cisco-specific tools, software, documentation, and forms that are explained in this guide.

Some procedures described in this guide are optional because they depend upon a particular configuration or service provider preference. If you are not certain whether or not you should perform an optional task, please feel free to contact your account representative or Cisco Technical Assistance Center (TAC) for assistance. Unless specified as optional, assume the procedure or task must be completed.

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## 3.3 Cisco WiMAX Documentation

Table 3-1 is a complete list of all documents and forms referenced in this guide. Cisco WiMAX documents are maintained on a LiveLink web page. When you completed your skills certification/qualification, you should have received your login instructions. If not, please contact the Cisco BWBU WiMAX Documentation team by emailing [bwbu-docs@cisco.com](mailto:bwbu-docs@cisco.com). Refer to the following link for access to the appropriate LiveLink web page:

BWBU\_Documentation:

<https://tools.cisco.com/cws/livelink?func=ll&objid=4353291&objaction=browse>

Note that for some components in the WiMAX Profile C configuration, this guide refers to other Cisco documentation [for example, the Access Services Network Gateway (ASN-GW)]. When those components are referenced, a link to the [www.cisco.com](http://www.cisco.com) site is provided.

Please make sure you have access to all necessary documentation prior to beginning the installation. Some documents and forms are software- or hardware-level sensitive. Always ensure you have the correct version of documents related to the system you are installing.

**Table 3-1 Cisco WiMAX Documentation**

Title of Document or Form	Where to Find It	Cisco Part Number
Release Notes for BWX Mobile WiMAX Release 10.0	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-19152-01
BWX Mobile WiMAX Cell Site Planning Guide	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16328-04
BWBU WiMAX Documentation Roadmap	LiveLink Site: BWBU_Documentation> STANDARD_DOCS>10.0 Standard Documents	OL-18211-03
BWX Mobile WiMAX RF Planning Guide	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16333-04
BWX Mobile WiMAX Migration Planning Guide	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16311-04
BWX Mobile WiMAX Overview Manual	LiveLink Site: BWBU_Documentation> STANDARD_DOCS>10.0 Standard Documents	OL-16317-04

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**Table 3-1** Cisco WiMAX Documentation

Title of Document or Form	Where to Find It	Cisco Part Number
BWX Mobile WiMAX Configuration Guide	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16313-04
Configuring WiMAX Subscriber Stations Using Cisco Access Registrar (CAR)	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-17837-03
BWX EMS Software Installation Guide	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16309-04
BWX EMS Config CLI Reference Manual	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16306-04
BWX EMS Overview Manual	LiveLink Site: BWBU_Documentation> STANDARD_DOCS>10.0 Standard Documents	OL-16308-04
BWX EMS Alarm Resolution Reference Manual	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16305-04
BWX EMS Diagnostic Tools Guide	LiveLink Site: BWBU_Documentation>Standard By Request Only Documents>10.0 Standard by Request Documents	OL-16307-04
BWX 350 USB Modem User Guide	LiveLink Site: BWBU_Documentation> STANDARD_DOCS>10.0 Standard Documents	OL-19151-02
BWX Modem Diagnostics Tool User Guide	LiveLink Site: BWBU_Documentation>TIER 1 & 2 Technical Support Docs>10.0 Tier 1 & 2 Technical Support Docs	OL-17840-04
Cisco Recommended Tools	<a href="#">Appendix A, “Cisco Recommended Tools”</a>	OL-16336-04
RF Coverage Prediction Map	<a href="#">Appendix B, “RF Coverage Prediction Map Example”</a>	OL-16336-04

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**Table 3-1 Cisco WiMAX Documentation**

Title of Document or Form	Where to Find It	Cisco Part Number
Site Candidate Evaluation Form	LiveLink Site: BWBU_Documentation>TIER 1 Installation & Commissioning Docs>10.0 Tier 1 Installation & Commissioning Docs  Copy of front sheet shown in <a href="#">Appendix C, “Site Candidate Evaluation Form”</a>	OL-16336-04
RF Center Frequency & Interference Analysis Guidelines	<a href="#">Appendix D, “RF Center Frequency and Interference Analysis Guidelines”</a>	OL-16336-04
Channel Filter Installation Procedure	<a href="#">Appendix E, “BWX 8415 Channel Filter Installation Procedure”</a>	OL-16336-04

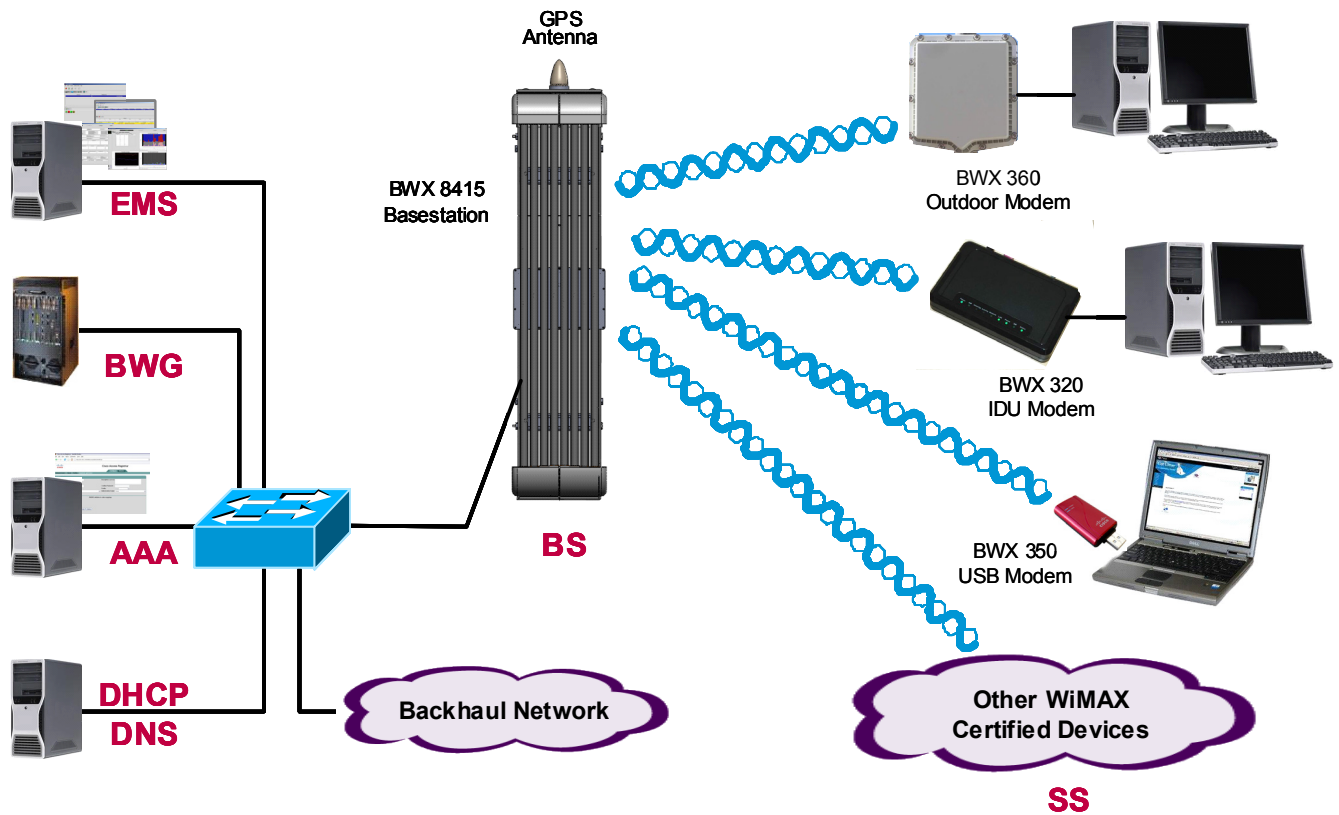
## 3.4 BWX 8415 Basestation Components

A Cisco BWX Mobile WiMAX system provides wireless broadband access to a core network, typically to the Internet or to any local or wide area network (LAN/WAN). When a service provider has established BS's in a given coverage area, the subscriber connects a BWX 350 USB Modem or other WiMAX-certified device to their computer to access the network without the need for a professional installer.

This is what Cisco refers to when it says its system is “zero-install®”: no truck rolls, no professional installation schedule for the consumer. In fact, some service providers have their subscribers pick up their modems at retail stores, or, in some cases, simply mail the modems to the subscribers. The subscriber modem is generally referred to as Subscriber Station (SS). The SS can be a BWX 350 USB Modem, which inserts into the USB slot of a laptop computer, or another WiMAX-certified device.

In Release 10.0 Cisco offers three subscriber stations (SS): the BWX 320 IDU modem, the BWX 350 USB modem, and the BWX 360 Outdoor modem. The BWX 320 IDU modem connects to PCs, utilizing the ethernet connection of the PC and covers a 5 MHz frequency range, the BWX 350 USB modem plugs into laptops, utilizing the USB port of the PC and covers a 5 MHz frequency range, and the BWX 360 Outdoor modem connects to PCs, utilizing the ethernet connection of the PC and covers a 5 or 10 MHz frequency range.

The entire BWX Mobile WiMAX system (Figure 3-1) has six main components: one or more basestations, Subscriber Stations (SSs, also referred to as modems), the Element Management System (EMS), the Broadband Wireless Gateway (BWG), the Authentication, Authorization, and Accounting (AAA) server, and the Dynamic Host Configuration Protocol/Domain Name Server (DHCP/DNS) server. The BS portion of the system consists of the Radio Unit (RU) and the Antenna Unit (AU).

**PRELIMINARY****Figure 3-1 BWX Mobile WiMAX System Components**

The BS performs the conversion of RF signals to digital signals for packets transmitted uplink (SS to BS), and converts digital signals to RF signals for packets transmitted downlink (BS to SS). The BS interfaces with the BWG and either directs traffic to/from the BWG (residential service) or tags the traffic to route to/from a private network (Business/Enterprise service).

The BS uses a Global Positioning System (GPS) antenna connected to the built-in GPS circuit.

Warranty and ongoing TAC support on the BS only covers BSs deployed with the supported configuration.

The EMS is a set of software applications that the service provider uses to configure, communicate with, and manage all the system elements directly related to the Broadband Wireless Access system. EMS provides a single point for managing BWG-to-BS, BWG-to-EMS, BS, and SS communications in a WiMAX network.

The EMS is an IP-based element manager designed in a server-client relationship and runs on either Windows or Solaris Operating Systems. Most service providers use the Client EMS Configuration & Alarm Manager (CAM) application to interface with the system. All of the functions that can be performed through the CAM can also be performed through a Command Line Interface (CLI), which is a common computing language across platforms. In addition, the CLI can run scripts consisting of a text file with CLI commands. This functionality is not available in the CAM.

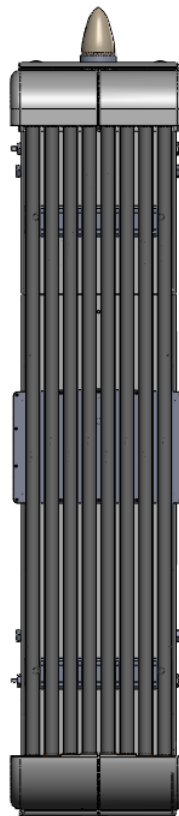
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## 3.5 Beamforming

Cisco BWX 8415 Basestation antennas contain eight elements (Figure 3-2), with a gain of 16 dBi. Their combined effect is to concentrate the downlink data into a beam with maximum gain at the location of each target SS (Figure 3-3).

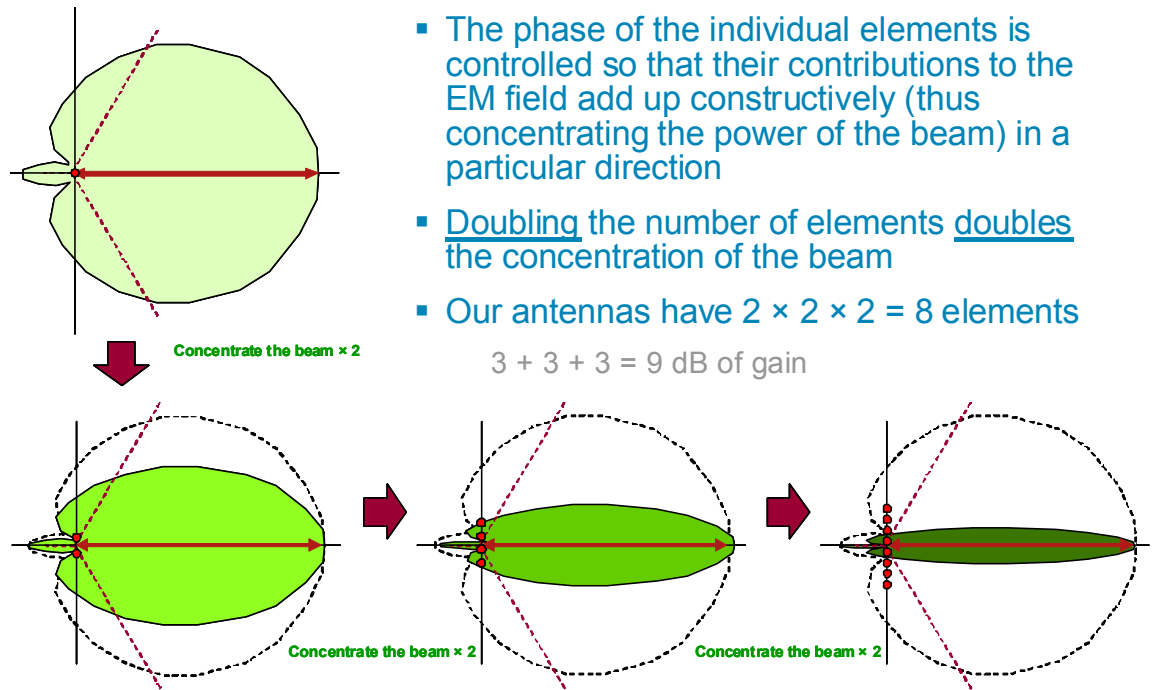
Similarly, in the uplink the data transmitted by each SS is received by the eight antenna elements with different phases due to the differences in propagation distance from an SS to each antenna element. The contributions from an SS are added up coherently after adjusting their phases for maximum gain. This effect, which we call beamforming, is equivalent to having up to 18 dB of additional gain in the downlink and up to 9 dB additional gain in the uplink. It allows the Cisco BWX Mobile WiMAX system to operate at a much lower power level than would otherwise be necessary for the same results.

**Figure 3-2** *BWX 8415 Basestation*



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Figure 3-3 Beamforming



# ***PRELIMINARY***